4. Emergency Services Stage 2

4.1 Enhanced Wireless Emergency Call

This scenario describes a 9-1-1 call initiated by an MS and routed to the appropriate PSAP based on base station, cellsite or sector routing information.

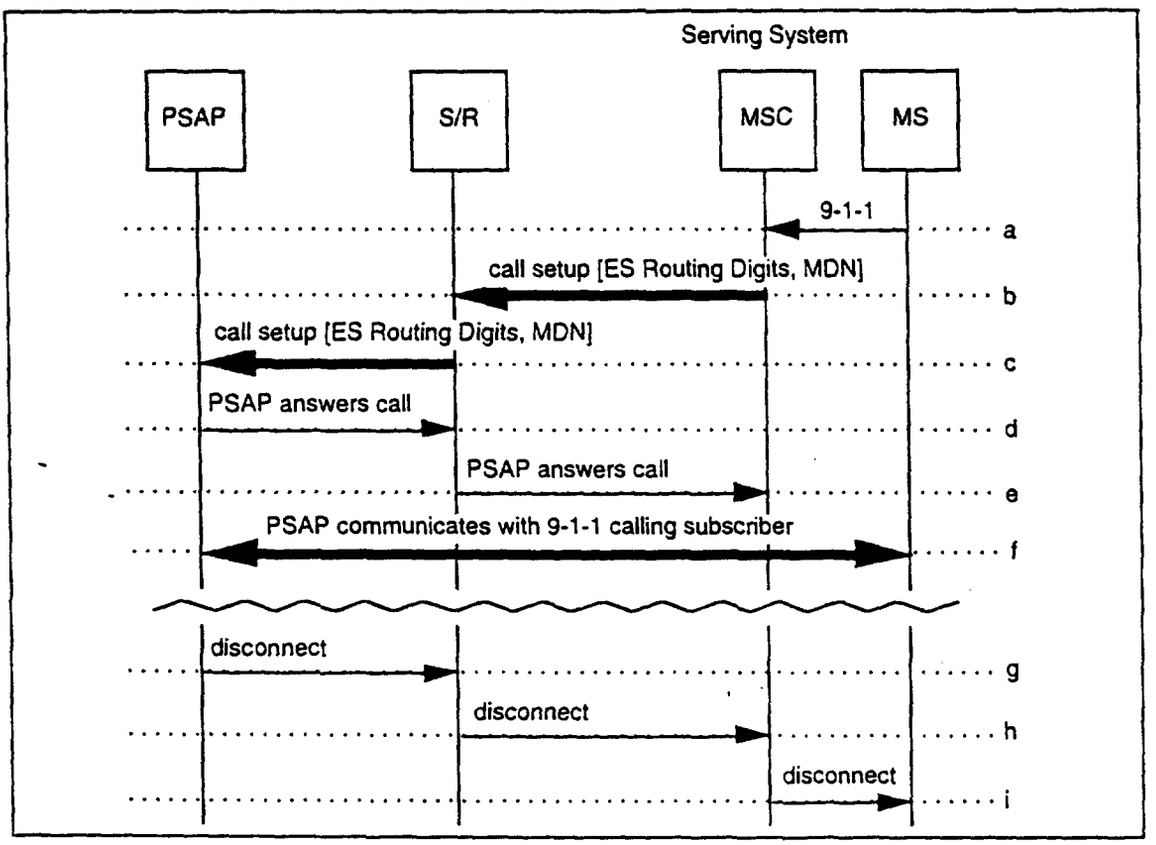


Figure 1 Enhanced Wireless Emergency Call

a. An MS user dials 9-1-1.

b. The Serving MSC, recognizing that an emergency call is being dialed, routes the call over dedicated facilities to a Selective/Router (S/R), transmitting the following information:

Parameters	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cellsite or sector.	R
MDN	MobileDirectoryNumber. Identifies the MS from which 9-1-1 was dialed.	R

c. The S/R forwards the call to the appropriate PSAP. This routing decision may take into account the location of the MS, time of day, etc.

Note: Interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are shown for illustrative purposes.

d. The PSAP answers by connecting to the 9-1-1 calling subscriber and returning answer supervision to the S/R.

e. The S/R forwards the PSAP's answer supervision signal to the Serving MSC.

f. The PSAP's agent communicates with the 9-1-1 calling subscriber and provides an appropriate response to the emergency.

g. The PSAP's agent hangs up, the PSAP initiates disconnect of the call to the S/R.

h. The S/R forwards the PSAP's disconnect to the Serving MSC.

i. The Serving MSC releases speech path to the MS.

4.2 Alternate PSAP Reroute Enhanced Wireless Emergency Call

This scenario describes a 9-1-1 call initiated by an MS and routed (based on EmergencyServicesRoutingDigits information) to an initial PSAP. The initial PSAP's agent determines an Alternate PSAP is appropriate to respond to the 9-1-1 call and reroutes the call to the Alternate PSAP.

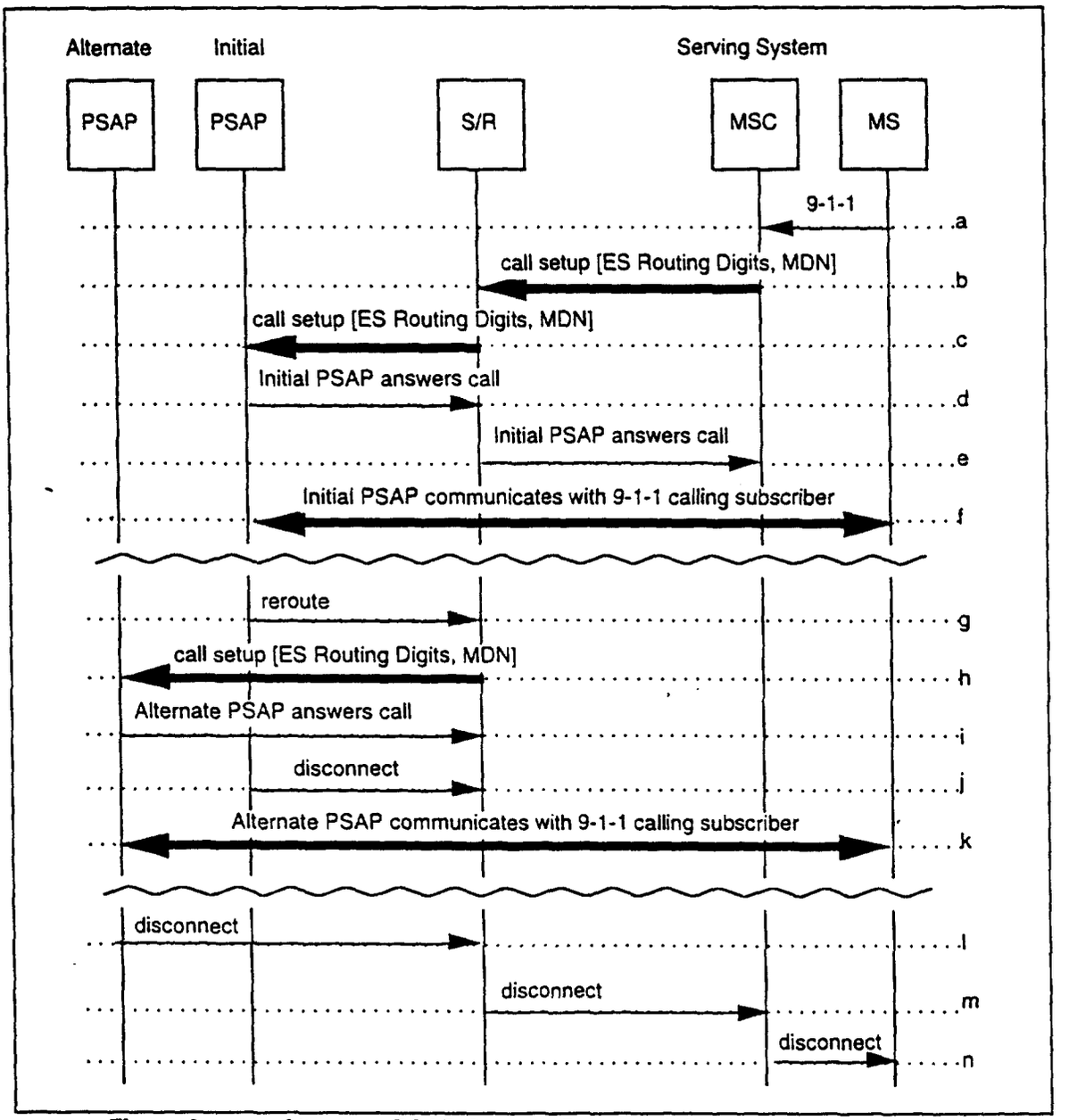


Figure 2 Alternate PSAP Reroute Enhanced Wireless Emergency Call

a. An MS user dials 9-1-1.

b. The Serving MSC, recognizing that an emergency call is being dialed, routes the call over dedicated facilities to a Selective/Router (S/R), transmitting the following information:

Parameters	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cellsite or sector.	R
MDN	MobileDirectoryNumber. Identifies the MS dialing 9-1-1.	R

c. The S/R forwards the call to the Initial PSAP. This routing decision may take into account the location of the MS, time of day, etc.

Note: Interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are shown for illustrative purposes.

d. The Initial PSAP answers by connecting to the 9-1-1 calling subscriber and returning answer supervision to the S/R.

e. The S/R forwards the Initial PSAP's answer supervision signal to the Serving MSC.

f. The Initial PSAP's agent communicates with the 9-1-1 calling subscriber and determines an Alternate PSAP is appropriate to respond to the emergency.

g. The Initial PSAP's agent initiates a reroute (to the Alternate PSAP) request to the S/R.

h. The S/R forwards the call to the Alternate PSAP.

i. The Alternate PSAP answers by connecting to the 9-1-1 calling subscriber and returning answer supervision to the S/R.

j. The Initial PSAP's agent hangs up, the Initial PSAP initiates disconnect of the call to the S/R.

k. The Alternate PSAP's agent communicates with the 9-1-1 calling subscriber and provides an appropriate response to the emergency.

l. The Alternate PSAP's agent hangs up, the Alternate PSAP initiates disconnect of the call to the S/R.

m. The S/R forwards the Alternate PSAP's disconnect to the Serving MSC.

n. The Serving MSC releases speech path to the MS.

4.3 Tandemed Delivery Wireless Enhanced Emergency Services Call

This scenario describes a 9-1-1 call that is tandemed through an intermediate switch, which does not have selective routing capabilities.

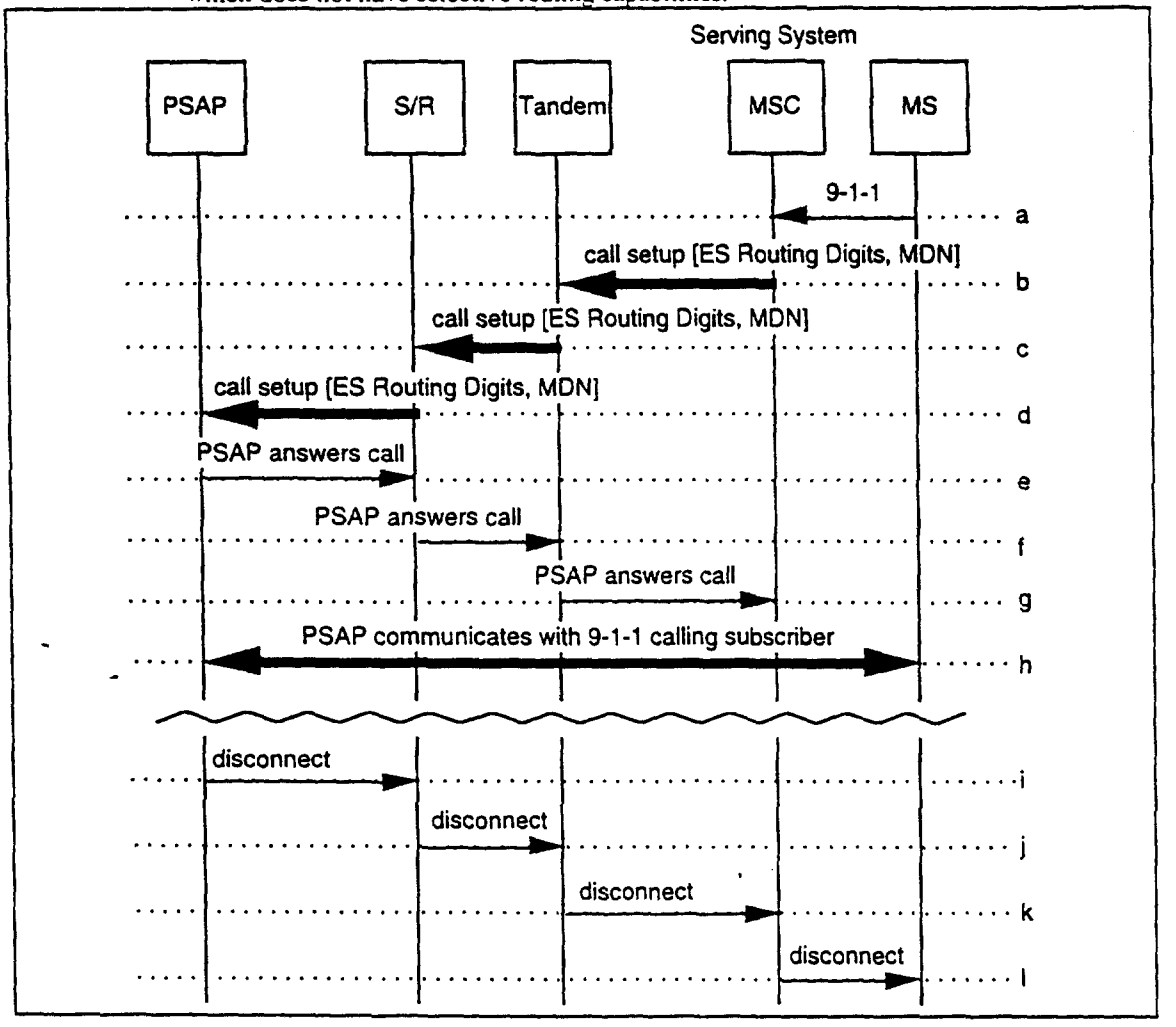


Figure 3 Tandemed Delivery Wireless Enhanced Emergency Services Call

a. An MS user dials 9-1-1.

b. The Serving MSC, recognizing that an emergency call is being dialed, routes the call to a tandem switch, transmitting the following information:

Parameters	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cellsite or sector. Information may also be included that will cause PSTN routing to terminate at the appropriate Emergency Services Network Entity. Note 1: Both pieces of information may be able to be merged, with the constraint that the base station, cellsite or sector identifier be a routable number allocated from the number plan on behalf of the ESNE and not the wireless carrier. Note 2: This number need not be a dialable number. For example, the office code of 911 could be used (e.g., 403-911-1234) to allow routing without the consumption of directory numbers.	R
MDN	MobileDirectoryNumber. Identifies the 9-1-1 dialing MS.	R

c. The tandem switch, using normal routing, routes the call toward the S/R. Multiple tandem switches may be involved.

d. The S/R forwards the call to the appropriate PSAP. This routing decision may take into account the location of the MS, time of day, etc. Note that interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are just shown for illustrative purposes.

e. The PSAP answers by connecting to the 9-1-1 calling subscriber and returning answer supervision to the S/R.

f. The S/R forwards the PSAP's answer supervision signal to the tandem switch.

g. The tandem switch forwards the PSAP's answer supervision signal to the Serving MSC.

h. The PSAP's agent communicates with the 9-1-1 calling subscriber and provides an appropriate response to the emergency.

i. The PSAP's agent hangs up. The PSAP initiates disconnect of the call to the S/R.

j. The S/R forwards the disconnect signal to tandem switch.

k. The tandem switch forwards the disconnect signal to the Serving MSC.

l. The Serving MSC releases speech path to the MS.

4.4 PSAP Callback Using MS's Directory Number

This scenario describes a 9-1-1 call followed, at some later time, by a callback from the PSAP using the Directory Number supplied by the signaling during the 9-1-1 call setup.

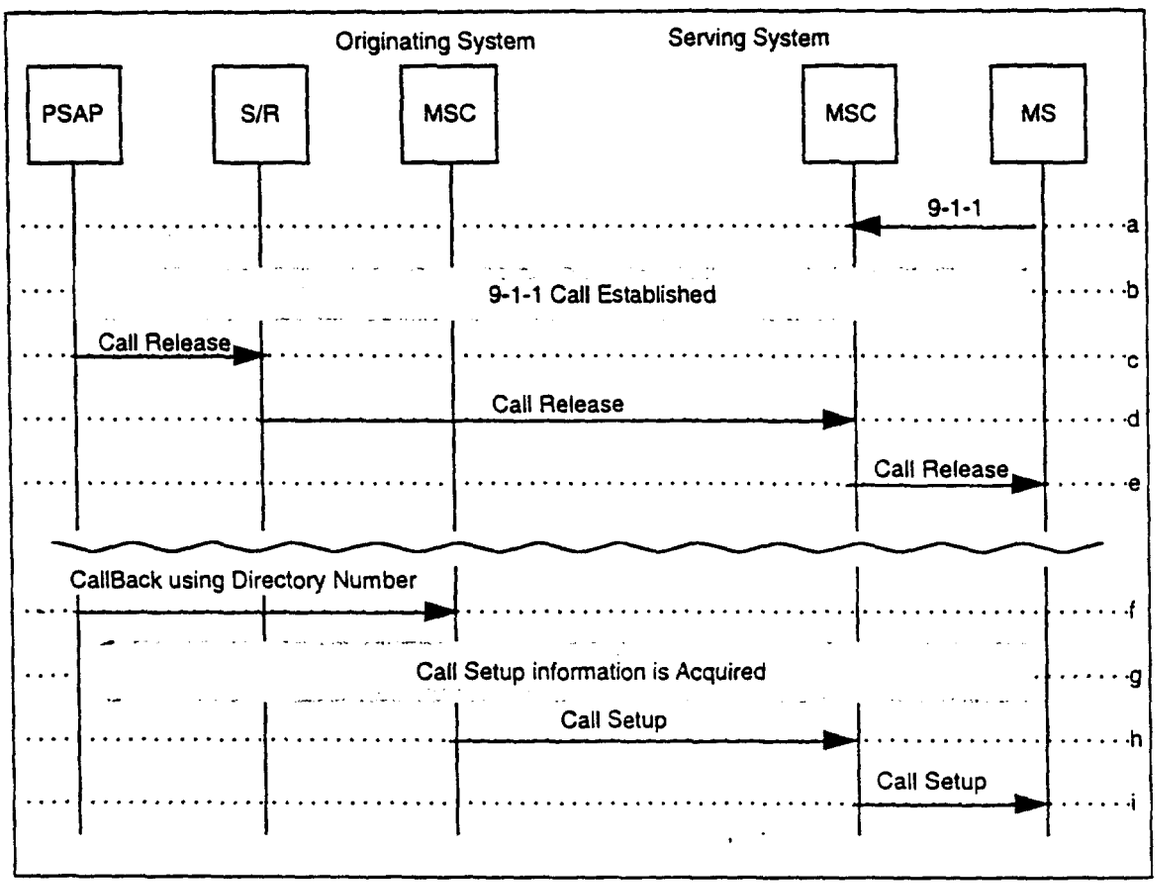


Figure 4 PSAP Callback Using the MS's Directory Number

a. An MS user dials 9-1-1.

b. An emergency call is setup.

c. The PSAP initiates a call release to the S/R.

d. The S/R forwards the PSAP's call release to the Serving MSC.

e. The Serving MSC releases the speech path to the MS.

f. Some time later, the PSAP determines that it needs to contact the 9-1-1 caller and dials the Directory Number that was delivered to it during Step b.

g. Normal call delivery ensues, with no guarantee that terminating features or restrictions will not prevent the call delivery or redirect the call (e.g. to a forward-to number).

h. If successful, the call is delivered to the Serving MSC.

i. This MSC will be unaware that this is a PSAP callback and will continue with normal Call Delivery procedures.

4.5 Emergency Call Reconnect

This scenario describes a reconnect to the PSAP after loss of radio contact to the MS during a 9-1-1 call.

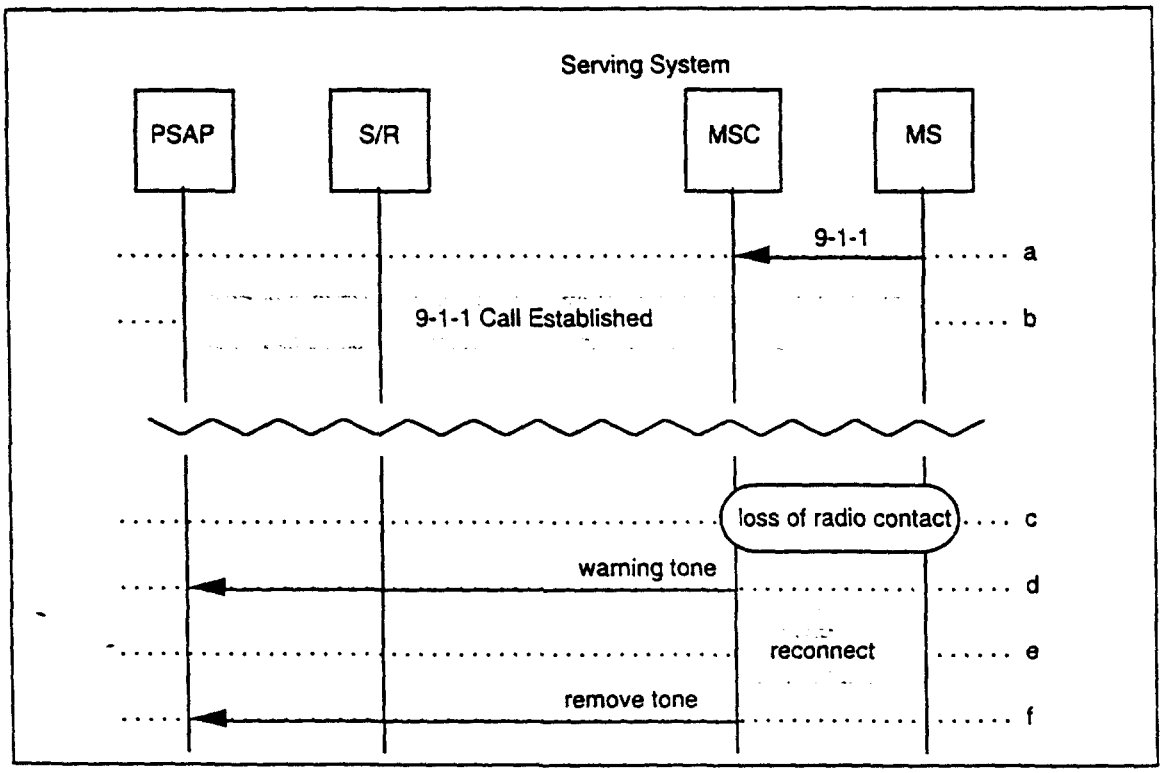


Figure 5 Emergency Call Reconnect

a. An MS user dials 9-1-1.

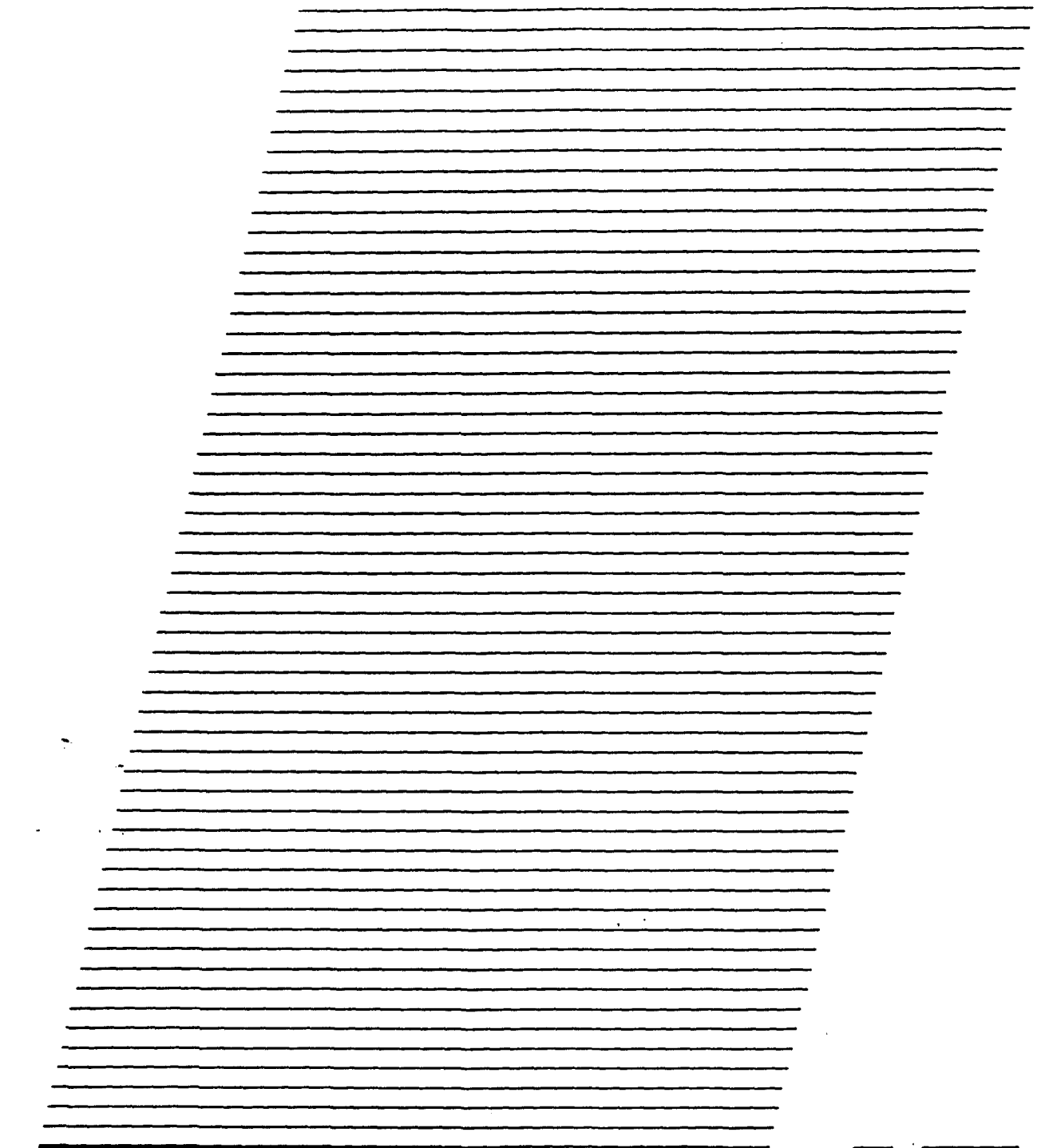
b. An emergency call is setup to the PSAP.

c. The MS disconnects due to an abnormal condition (e.g., loss of radio synchronization).

d. The Serving MSC determines that emergency reconnect should be provided. It may provide a warning tone to the PSAP (e.g., low tone).

e. Reconnection between the Serving MSC and the MS is attempted.

f. If the MS is reconnected, the warning tone is removed by the Serving MSC. If the MS was unable to be reconnected, the PSAP trunk could be connected to a recorded announcement or a distinct tone (such as reorder).



TR45

Enhanced Emergency Services

PN-3581.4

ANSI/TIA/EIA 41 Stage 2 Modifications

Ballot Version

ENHANCED EMERGENCY SERVICES: *ANSI/TIA/EIA 41* STAGE 2 MODIFICATIONS

LIST OF FIGURES

LIST OF TABLES

None

FOREWORD

This Foreword is not part of this Interim Standard.

This is one of a series of recommendations entitled

"ENHANCED EMERGENCY SERVICES"

which provides a solution for the limited capabilities of wireless Enhanced Emergency Services. These capabilities include:

- provision of base station, cellsite or sector identification information
- subscriber identification
- callback
- reconnect

The recommendations included in this series are:

- PN-3581.1, Enhanced Emergency Services: Functional Overview
- PN-3581.2, Enhanced Emergency Services: PSAP Perspective
- PN-3581.3, Enhanced Emergency Services: Emergency Services Stage 2
- PN-3581.4, Enhanced Emergency Services: *ANSI/TIA/EIA 41* Stage 2 Modifications
- PN-3581.5, Enhanced Emergency Services: *ANSI J-STD-023* Stage 2 Modifications
- PN-3581.6, Enhanced Emergency Services: *TIA/EIA/IS-93* Modifications
- PN-3581.7, Enhanced Emergency Services: *ANSI/TIA/EIA 41* Stage 3 Modifications
- PN-3581.8, Enhanced Emergency Services: *ANSI J-STD-024* Modifications

REVISION HISTORY

Revision	Date	Remarks
0	????	Initial Publication
A		
B		

NOTE

The numbering system of this series of Interim Standards varies from normal TIA/EIA practice. The unique numbering system assigned to these documents is intended to reflect their hierarchical structure.

1. INTRODUCTION

1.1 OBJECTIVE

This document presents recommendations for modifications to *ANSI/TIA/EIA 41* Stage 2 for the support Enhanced Emergency Services.

1.2 SCOPE

This document provides a solution for modifications to *ANSI/TIA/EIA 41* Stage 2 to support Enhanced Emergency Services.

1.3 ORGANIZATION

This document is organized by the following sections:

- Section 1, entitled "Introduction," provides introductory information for this Interim Standard.
- Section 2, entitled "References," lists the normative and informative references for this Interim Standard.
- Section 3, entitled "Terminology," lists the definitions, symbols, abbreviations, and other documentation conventions used in this Interim Standard.
- Section 4, entitled "*ANSI/TIA/EIA 41* Stage 2 Modifications," defines the modifications to the intersystem messaging in *ANSI/TIA/EIA 41* necessary to support Enhanced Emergency Services.

2. REFERENCES

The *ANSI/TIA/EIA 41* recommendations are:

- ANSI/TIA/EIA 41.1, *Cellular Radiotelecommunications Intersystem Operations: Functional Overview*
- ANSI/TIA/EIA 41.2, *Cellular Radiotelecommunications Intersystem Operations: Intersystem Handoff Information Flows*
- ANSI/TIA/EIA 41.3, *Cellular Radiotelecommunications Intersystem Operations: Automatic Roaming Information Flows*
- ANSI/TIA/EIA 41.4, *Cellular Radiotelecommunications Intersystem Operations: Operations, Administration, and Maintenance Information Flows*
- ANSI/TIA/EIA 41.5, *Cellular Radiotelecommunications Intersystem Operations: Signaling Protocols*
- ANSI/TIA/EIA 41.6, *Cellular Radiotelecommunications Intersystem Operations: Signaling Procedures*

The *TIA/EIA/IS-93* recommendations are:

- TIA/EIA/IS-93-0, *Cellular Radio Telecommunications Ai - Di Interfaces*

The *ANSI J-STD-023* recommendations are:

- ANSI J-STD-023, *PCN to PCN Intersystem Operations based on PCS1900 Standard, approved for publication.*

The *ANSI J-STD-024* recommendations are:

- ANSI J-STD-024, *Personal Communication Services, SS7 based A-interface Standard, approved for publication.*

3. TERMINOLOGY

3.1 DEFINITIONS

Refer to IS-911.1.

3.2 SYMBOLS AND ABBREVIATIONS

Refer to IS-911.1.

4. *ANSI/TIA/EIA 41* Stage 2 Modifications

4.1 9-1-1 Dialed in Call After Intersystem Handoff

This scenario describes 9-1-1 call dialed within a call causing a three-way call (with call processing modifications) following an intersystem handoff. This call will be set up from the Anchor MSC (if an intersystem handoff has occurred). This scenario depicts the 4-flash three-way calling method. An alternate 3-flash three-way calling method is available.

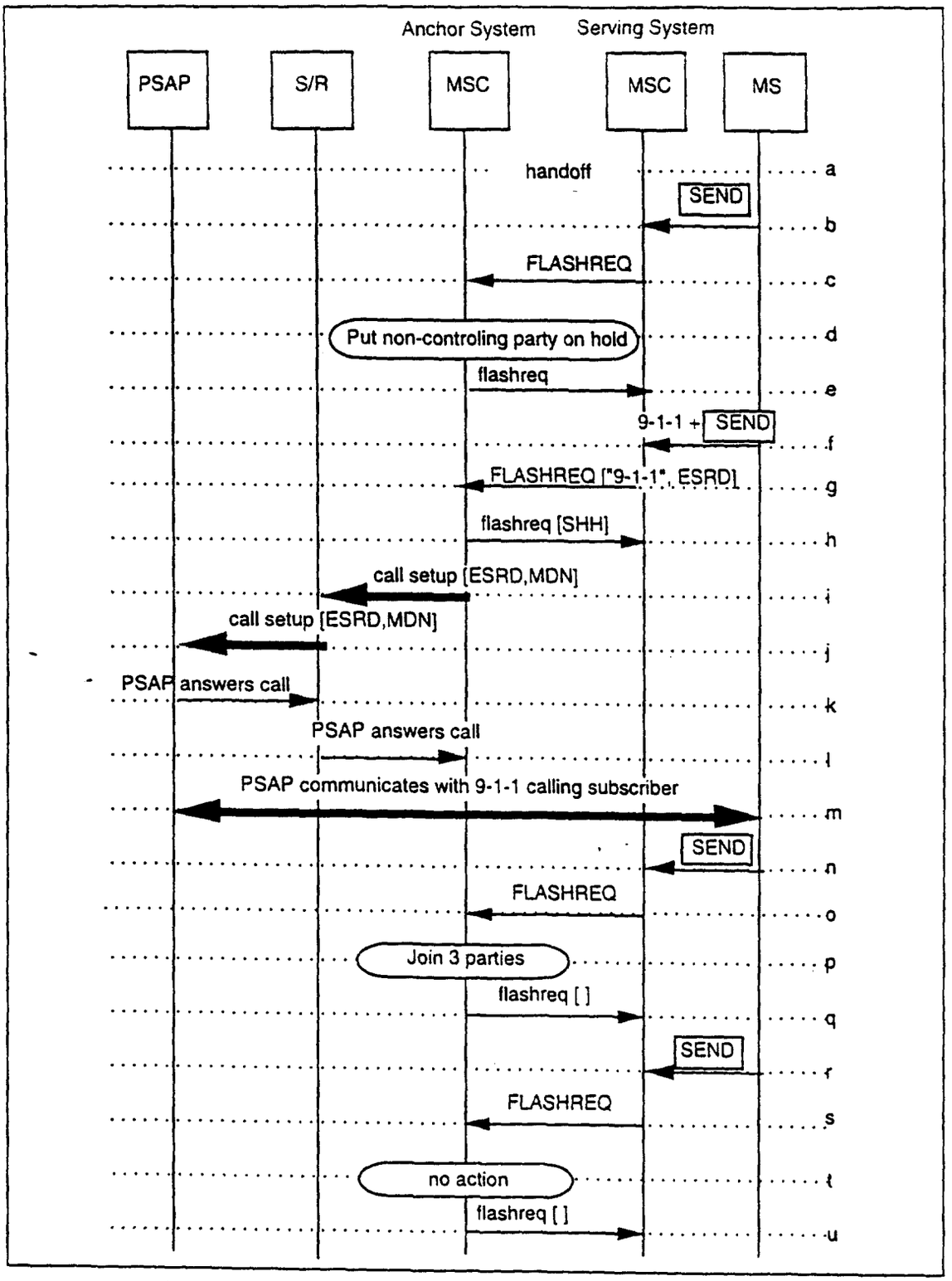


Figure 6 9-1-1 Dialed in Call After Intersystem Handoff

a. A call is handed off from one MSC to another.

b. Later, the user presses SEND (e.g., to initiate a 3-way call).

c. The Serving MSC forwards a FLASHREQ to the Anchor MSC, which determines that the MS has the Three-Way Calling feature active and is in a state able to invoke Three-Way Calling.

d. The Anchor MSC places the non-controlling party on hold and may provide dialtone to the MS.

e. The Anchor MSC responds with a `flashreq` to the Serving MSC.

f. The user dials 9-1-1 + SEND to originate an emergency call.

g. The Serving MSC forwards the flash digits (9-1-1) to the Anchor MSC in a FLASHREQ, containing the following parameters set to specific values for this scenario:

Parameters	Usage	Type
Digits(Dialed)	These are the digits dialed by the subscriber accompanying the flash. These digits are used by the Anchor MSC to determine if the flash event represents an attempt to place an emergency call.	R
ESRD	EmergencyServicesRoutingDigits. A unique identifier of a specific base station, cellsite or sector. If the Anchor MSC determines that an emergency call is being placed, the Anchor MSC uses the ESRD to supply information that will cause PSTN routing to terminate at the appropriate ESNE.	R

h. The Anchor MSC responds with a `flashreq` to the Serving MSC, containing the following parameters set to specific values for this scenario:

Parameters	Usage	Type
SHH	SpecialHandling. Included if the Anchor MSC has determined that the call is an emergency call.	O

i. The Anchor MSC, recognizing that an emergency call is being dialed, routes the call over dedicated facilities to a Selective/Router (S/R), transmitting the following information:

Parameters	Usage	Type
ES Routing Digits	Emergency Services Routing Digits. A unique identifier of a specific base station, cellsite or sector. Information may also be included that will cause PSTN routing to terminate at the appropriate ESNE. Note 1: Both pieces of information may be able to be merged, with the constraint that the base station, cellsite or sector identifier be a routable number allocated from the number plan on behalf of the ESNE and not the wireless carrier. Note 2: This number need not be a dialable number. For example, the office code of 911 could be used (e.g., 403-911-1234) to allow routing without the consumption of directory numbers.	R
MDN	MobileDirectoryNumber. Identifies the MS dialing 9-1-1.	R

j. The S/R forwards the call to the appropriate PSAP. This routing decision may take into account the location of the MS, time of day, etc.

Note: interfaces between S/R, PSAP and other emergency services network elements are outside the scope of this standard and are shown for illustrative purposes.

k The PSAP answers by connecting to the 9-1-1 calling subscriber and returning answer supervision to the S/R.

l. The S/R forwards the PSAP's answer supervision signal to the Anchor MSC.

m. The PSAP's agent communicates with the 9-1-1 calling subscriber.

n. The user presses SEND again.

o. The Serving MSC forwards a `FLASHREQ` to the Anchor MSC.

p. The Anchor MSC bridges the trunk to the MS, the trunk to the S/R and the trunk to the held party to allow a three-way conversation.

q. The Anchor MSC responds with a `flashreq` to the Serving MSC.

r. The user presses SEND again.

s. The Serving MSC forwards a `FLASHREQ` to the Anchor MSC.

t. The Anchor MSC takes no action to avoid disconnecting the PSAP from the call.

u. The Anchor MSC responds with a `flashreq` to the Serving MSC.

4.2 Emergency Call Reconnect After Intersystem Handoff

This scenario describes a reconnect to the PSAP after loss of radio contact to the MS during a 9-1-1 call.

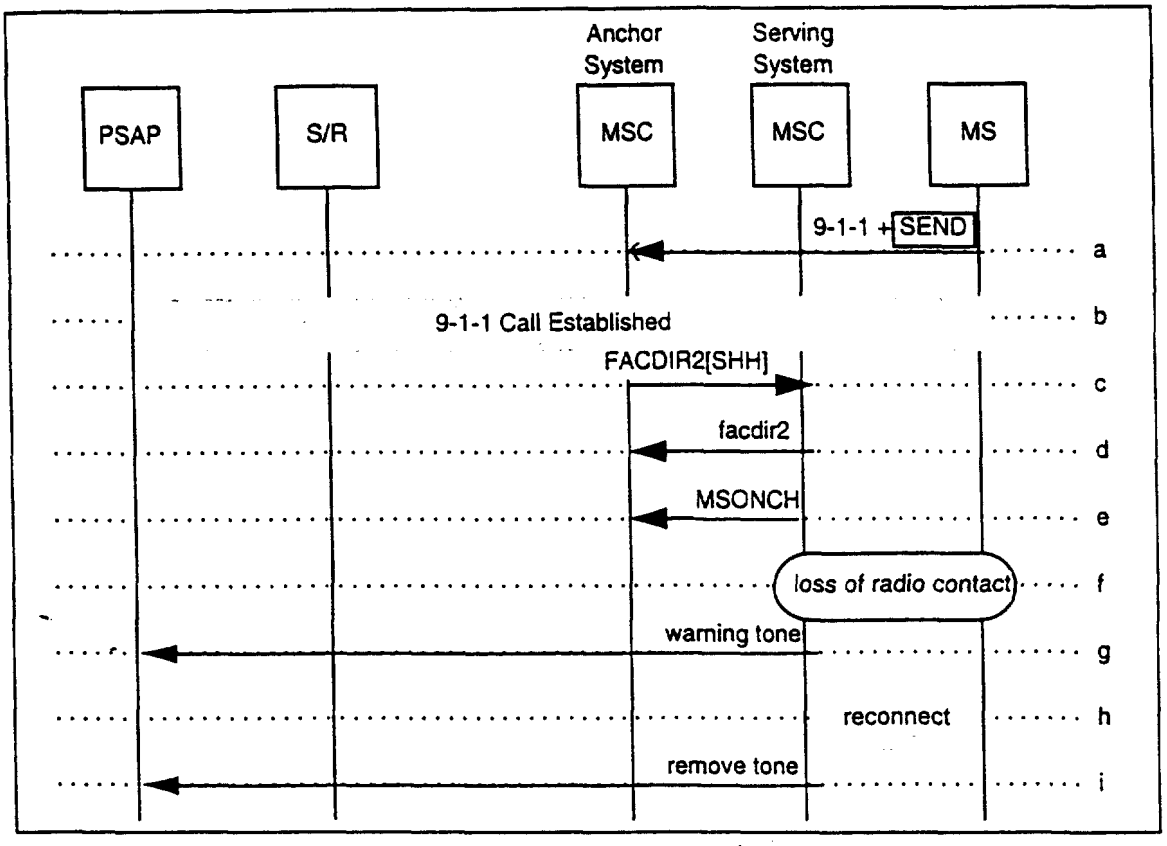


Figure 7 Emergency Call Reconnect After Intersystem Handoff

a. An MS user dials 9-1-1 + SEND.

b. An emergency call is setup (using any of the previous scenarios).

c. An intersystem handoff is initiated through the FACDIR2. It contains the SHH parameter to indicate that an emergency call is being handed off. Note that the SHH parameter is also required in the HANDBACK2 and HANDTHIRD2 messages to support all inter-MSC handoff scenarios.

d. The Serving MSC acknowledges with a facdir2.

e. The Serving MSC reports the arrival of the MS on the new channel with an MSONCH.

f. The MS disconnects due to an abnormal condition (e.g., loss of radio synchronization).

g. The Serving MSC, based on the SHH indicator, determines that emergency reconnect should be provided. It may provide a warning tone to the PSAP (e.g., low tone).

h. The Serving MSC attempts to reconnect the MS (e.g., by paging).

i. If the MS is reconnected, the warning tone is removed by the Serving MSC. If the MS was unable to be reconnected, the PSAP trunk could be connected to a recorded announcement or a distinct tone (such as reorder).

4.3 Callback Using Standard Roamer Port

This scenario describes a callback from the PSAP using a roamer port.

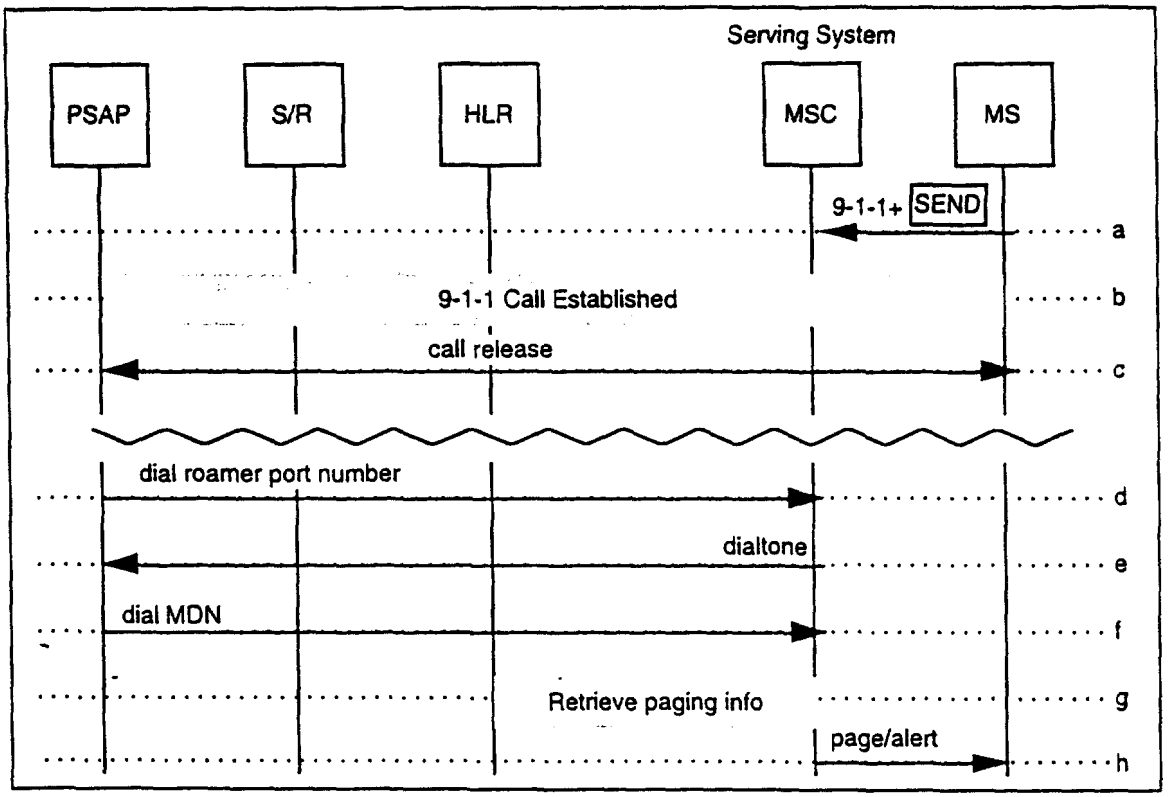


Figure 8 Callback Using Standard Roamer Port

a. An MS user dials 9-1-1 + SEND.

b. An emergency call is setup.

c. The call is disconnected.

d. Some time later, the PSAP determines that it needs to contact the 9-1-1 caller and dials the roamer port number of the system that the call was received from (determined from the ESRD information delivered during step b).

e. Second dial tone is provided to the PSAP to prompt it to enter the MS identification.

f. The PSAP dials the Mobile Directory Number (MDN).

g. Optionally, retrieve paging information. This will work only if at least one of the following is true:

   i. The MDN and MIN are the same.

   ii. The MS is in its home system.

   iii. The MSC supports *ANSI/TIA/EIA 41* recommendations to accept an MDN from a roamer port instead of a MIN.

h. The MSC terminates the call to the MS.